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A COMPUTERIZED SEMANTIC DICTIONARY EVALUATION OF STUDENTS' ATTITUDES TOWARDS THEIR COURSES

by

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University of Alberta

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled **A COMPUTERIZED SEMANTIC DICTIONARY EVALUATION OF STUDENTS' ATTITUDES TOWARD THEIR COURSES** submitted by **James Allison Carter Jr.** in partial fulfilment of the requirements for the degree of Master of Education.

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ABSTRACT

A student's attitude towards a course is considered to be an important factor effecting his achievement or lack thereof in the course. There is a need for general method of measuring the affective attitudes of students.

This study investigated the use of a computerized method of measuring students' affective attitudes. Students were required to write essays dealing with their past, present and proposed future attitudes towards their subject of study. The essays were scored by calculating the average semantic scores of all words contained in each essay that were also included in an available semantic dictionary. The essays also were scored by three educators to provide a reference for comparison purposes.

Significant correlations were found between the semantic dictionary scores and the scores of the educators. Significant correlations also were found between the semantic dictionary scores and both current and future acheivement scores. The evaluation semantic score and a composite semantic score were found to provide the best attitude measures.

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Chapter I

1.0 THE PROBLEM

1.1 Introduction

According to Evans (1971), Bloom (1976) and others, a student's achievement in a course is effected by his affective attitudes towards the course. Vocational and technical education usually attempts to give all of its students mastery of the subject being taught, in order that these students will succeed in future employment. Currently, vocational and technical education places most emphasis and directs practically all testing toward cognitive and psychomotor skills. The absence of valid and reliable affective attitude tests for general use may be part of the cause of this. If affective attitudes are important to a student's success, then there is a need for an easily used, valid and reliable general test of attitudes. Such a test must be appropriate for attitudes towards all kinds of subjects if it is to have the greatest benefit in the field of vocational and technical education.

One of the most general testing methods, according to Oppenheim (1966), Gronlund (1796) and others, is the essay test. This method, however, produces a conciderable problem in scoring for cognative content, and even moreso for scoring for attitudinal content.

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A semantic dictionary, proposed by Osgood (1956) and compiled by Heise (1978) contains a listing of words along with scores on the affective dimensions of evaluation, potency and activity. It is proposed that an essay could be scored for its attitude towards its subject with the help of a semantic dictionary. Such a process could be greatly facilitated with the help of a computer.

1.2 General Statement of the Problem

If educators are to provide for the individual differences amongst their students, methods of identifying and measuring these differences must be available. The procedures for evaluating cognitive differences have been well developed and are readily available for use. Psychomotor differences also can be diagnosed readily through the evaluation of products of various combinations of psychomotor skills. The technology of evaluation of affective attitude differences has not advanced to a comparable level of development. Current attitude measures are only found to be valid within small sectors of society. There is a need for a general method for measuring the affective attitudes of various groups of students. This research looks at one proposed general method of evaluating a student's affective attitudes towards his courses. It further looks at how such an evaluation can be used as a predictor of the student's success in these courses.

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1.3 Purpose of the Study

It was the purpose of this study to determine if affective entry attitudes in vocational and technical education can be measured by a general essay type test, scored using a semantic dictionary. It was further purposed to determine whether this method can be used in various vocational and technical areas without modification. Both the descriptive and predictive qualities of the method were investigated.

This method could be used in a descriptive sense to measure the success of instructional delivery methods. The method could be especially valuable in evaluating different forms of delivery in individualized instruction such as computer managed instruction. The method could also be used in detecting attitude successes or conflicts developing in student-teacher relations.

In a predictive sense, the method could be used at the start of a course to identify students who require special attention due to attitude problems. In this manner the variation in achievement due to inappropriate attitude could be minimized, and the quality of instruction could be improved.

1.4 Questions to be Answered

The following questions were investigated:

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a) Does the method measure affective entry attitudes?

b) Is the method educationally descriptive?

c) Is the method educationally predictive?

d) Is the method of general descriptive use in the various types of vocational and technical courses?

e) Is the method of general predictive use in the various types of vocational and technical courses?

1.5 Conceptual or Substantive Assumptions

It is assumed that the course grades assigned to students are both reliable and valid as a measure of student achievement in the course. This assumption is based upon the traditional acceptance of school grades by society.

It is assumed that a semantic differential instrument of the type used by Heise (1965) measures the components of connotative meaning.

It is assumed that the factors of semantic space are cross-cultural as reported by Osgood (1972) and therefore can be used as universal reference points for describing the connotative meaning.

It is assumed that the semantic space coordinates of a word are universally valid within a single language culture (Osgood, 1975). It is assumed, further, that North American

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English represents a single language culture. Since the semantic coordinates of Heise's semantic dictionary (1978) were derived from the North American English language culture it is assumed that they are valid for the language culture of the research population.

It is assumed that the educators, who evaluated the completed research instruments, evaluated them to the best of their ability, solely on the basis of attitudes contained in these completed research instruments.

1.6 Rationale and Theoretical Framework

Vocational and technical education strives to bring students to mastery levels of achievement in order that they may work successfully in productive society. A student's individual differences should be understood for the educator to best help the student work towards this mastery. One factor of major importance to achievement of mastery learning is the affective attitudes of the student. Therefore, there is a need for a method of testing these attitudes so that vocational and technical educators can evaluate the affective attitudes of a student.

The method should be a general one so that it can be of use in various subjects. The method should also be reusable without contamination in later results due to the influences of its previous uses. To be reusable in such a

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manner, the method should not promote the learning or memorization of its questions or answers, in such a way as to influence later testing. The method should not lead a student to a particular trend of thought or suggest possible answers or solutions to the student. The ideal attitude testing method, therefore, should elicit only those attitudes which the student actually has developed without influencing the expression of these attitudes. The closer an attitude test comes to this ideal, the harder it is to score by conventional means.

The connotative meanings of words can be measured by a semantic differential as a set of three dimensional coordinates in semantic space. This connotative meaning of words is found to have a universal value within a particular language culture. A dictionary can be composed of words and their semantic coordinates for such a language culture. Individuals within the culture will have vocabularies which are subsets of the language as a whole. To describe a thing or attitude, a person will choose from his vocabulary those words which best represent his view of the meaning, both connotative and denotative. Similar attitudes can be described with the use of words of similar connotative meaning by all persons within the language culture. Since connotative meanings can be measured, these measures should be useful in the indirect measurement of attitudes contained contained in a person's description.

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It is suggested, in order to score essay type material for affective attitudes, that a sample of the words in the essay be scored with the aid of a semantic dictionary. This way the connotative meaning measure could provide an indirect measure of related attitude. This method has proved successful in evaluating literature (Anderson and McMaster, 1978). It could prove useful in vocational and technical education for assessing students' affective attitudes and thus aiding the educator in developing a mastery learning environment. It could also prove useful in evaluating the affective outcomes of vocational and technical education programs.

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1.7 Delineation of Research Problem

The research questions were addressed in the following ways:

a) Does the semantic dictionary method measure affective entry attitudes? The instrument will be investigated by comparison of its results with expert ratings.

b) Is the method educationally descriptive? This question will be answered by the correlation of results of the instrument with concurrent achievement scores.

c) Is the method educationally predictive? This question will be answered by the correlation of results of

the instrument from the start of the course with the achievement scores at the end of the course.

1.8 Statement of Hypotheses

The following hypotheses are formed from the Deliniation of the Research Problem:

a) It is hypothesized that a generalized attitude test of essay form can be scored for affective attitude components by the use of a semantic dictionary.

b) It is hypothesized that such a generalized attitude test can be used descriptively in vocational and technical education.

c) It is hypothesized that such a generalized attitude test can be used predictively in vocational and technical education.

1.9 Importance of the Study

This study could provide vocational and technical educators with a tool to aid in reducing problems in achievement amongst students arising from attitude problems and to aid in achieving a mastery learning situation. It could also provide these educators with a tool to assess and evaluate the achievement or lack of achievement of affective behavioral objectives.

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This study could lead the way to research on individualized prescriptions for attitude problems within education.

1.10 Definition of Terms

a) AFFECTIVE ENTRY CHARACTERISTICS are "The extent to which the student is (or can be) motivated to engage in the learning process." (Bloom, 1976, p. 11) "We regard the initial affective characteristics as a complex compound of interests, attitudes, and self-views. Although we prefer the term Affective Entry Characteristics to the term motivation, the two terms are not contradictory." (Bloom, 1976, p 11) In this study, the affective entry attitudes are those interests, attitudes and self views that relate to the material to be covered in the courses; and thus can be described in terms of evaluation, activity and potency.

b) AFFECTIVE ENTRY ATTITUDES will be defined as synonymous to AFFECTIVE ENTRY CHARACTERISTICS. This is because interests and self-views can be considered as particular types of a person's attitudes. It is felt that the use of the term "attitudes" provides greater clarity than using the term "characteristics".

c) COGNITIVE ENTRY BEHAVIORS are "The extent to which the student has already learned the basic prerequisites to the learning to be accomplished." (Bloom, 1976, p. 11)

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d) QUALITY OF INSTRUCTION is "The extent to which the instruction is appropriate to the learner." (Bloom, 1976, p 11)

e) LEVEL OF ACHIEVEMENT is a measure of a student's knowledge in the area of concern. Level of achievement in a course is commonly measured in terms of a student's final grade in that course.

f) SEMANTIC DIFFERENTIAL is the instrument used to provide data for SEMANTIC DIFFERENTIATION. It is composed of a number of bipolar rating scales situated between pairs of semantic opposites.

g) SEMANTIC DIFFERENTIATION is "the successive allocation of a concept to a point in the multidimensional semantic space by selection from among a set of given scaled semantic alternatives." (Osgood, 1957, p 26)

h) SEMANTIC SPACE is the multidimensional realm having three factors of semantic meaning as its dimensions: evaluation, potency, and activity.

i) SEMANTIC ATLAS or SEMANTIC DICTIONARY is "a quantized Thesaurus - in which the writer would find nouns, adjectives, verbs, and adverbs (all lexical items) listed according to their locations in semantic space, as determined from the judgments of representative samples from the population." (Osgood, 1957, p 330)

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j) EVALUATIVE FACTOR "is characterized by scales like good-bad, pleasant-unpleasant, and positive-negative." (Osgood, 1957, p 11)

k) POTENCY FACTOR "orthogonal to evaluation, is characterized by scales like strong-weak, heavy-light, and hard-soft." (Osgood, 1975, p 12)

l) ACTIVITY FACTOR "independent of both evaluation and potency, is characterized by scales like fast-slow, active-passive, and excitable-calm." (Osgood, 1957, p 12)

m) EDUCATIONALLY DESCRIPTIVE means to have concurrent validity for educational use.

n) EDUCATIONALLY PREDICTIVE means to have predictive validity for educational use.

1.11 Scope and Delimitations of the Study

The population consists of students enrolled in the vocational and technical courses offered at NAIT. The sample consisted of the students enrolled in three courses in the population.

NAIT provided two testing periods, of approximately three quarters of an hour each within the duration of the course, one within the first week and one within the final week of the course.

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NAIT provided course grades for the students involved in the study. This was done using student identification numbers to insure privacy but to allow correlation with testing results.

The study deals with data derived from both student course grades and the evaluation of research instruments completed by the students.

The semantic dictionary compiled by Heise (1978) was used in the evaluation of the research instruments.

Three persons were also selected from the educational community at the University of Alberta to provide a comparitive analysis of the attitudes contained in the research instruments.

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Chapter II

2.0 REVIEW OF LITERATURE

Various researchers have investigated the relationship between students' affective attitudes and their academic achievement. Much of the research that has been done has been in very specific areas. Bloom (1976) has put together a good review that sumarizes many of the causal relations that effect academic achievement. His book, therefore, was used as the main source of reference in this area.

2.1 Individual Differences

There is a considerable concern among educators about the effects of a student's individual differences on his scholastic achievement. These individual differences are the result of the student's unique history. By the time a student reaches vocational or technical education programs, his unique history will have developed substantial individual differences between him and each of the other students in the class. Evans (1971) notes that surprising little is known about how these differences relate to learning.

2.2 The Effects of Differences in Students' History, on Their Achievement

According to Bloom (1976), the majority of variance in

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student achievement in a learning task can be accounted for by two characteristics that a student brings to the learning task. These student characteristics are composed of two types: " Cognitive Entry Behaviors" and "Affective Entry Characteristics". Individually these factors may account for up to 50 per cent and 25 per cent, respectively, of the variance in student achievement (Bloom, 1976, pp. 58, 104). In combination they interact to account for up to 65 per cent of the variance in student achievement (Bloom, 1976, p 169).

Bloom cites a third factor "Quality of Instruction" as accounting for an additional 25 per cent of the variance in student achievement (Bloom, 1976, p 135). For the quality of instruction to be most effective, it must address the shortcomings in student characteristics in a remediating manner before attempting the actual instruction.

These conditions which need to be altered in either the students or the school are primarily caused, as noted above, by individual differences resulting from the unique histories of the students. Bloom notes that prior applications of theory to school situations have largely ignored individual differences in history.

Knowledge of individual student characteristics is essential in order to provide background information for the teacher to reduce the variance in student achievement.

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2.3 Cognitive Entry Behaviors

The area of cognitive entry behaviors, also commonly known as prerequisite skills, provides the largest and most readily measured correlation with student achievement. Various instruments have been developed and validated to test this factor with varying levels of correlations with student achievement. Generalized intelligence tests, which are readily available, are found to correlate with student achievement, providing a squared correlation coefficient of .25 (Bloom, 1976, p 46). Specifically designed and validated tests can achieve a squared correlation coefficient of up to .50 (Bloom, 1976, p 47). By comparing student performance objectives with instructional objectives and curricula, a teacher should be able to determine the necessary pre-requisite cognative skills for a course. These pre-requisites, along with other skills recognized as necessary, from experience with the course , can be used in constructing a specific test of student cognitive entry behaviors.

Once the teacher determines what cognitive entry skill deficiencies a student has, two courses of action are available. The most obvious would be to provide remedial instruction and then to retest. The other course of action would reanalyze the learning task to find an alternative means of arriving at the objective. Then the teacher could

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choose a method that uses only skills that the student already has.

2.4 Affective Entry Characteristics

Affective Entry Characteristics are basically those attitudes that a learner brings to a learning task. Simpson (1978) notes the affective domain is composed of a myriad of feelings and attitudes. He further states that how a person behaves during a course will be influences by the affective attitudes he brings to the course as well as those attitudes that are aroused during the course.

In Bloom's definition the main focus is upon the various attitudes of the learner. "We regard the initial affective characteristics as a complex compound of interests, attitudes, and self-views." (Bloom, 1976, p. 75) Interests and self-views can be seen to be particular types of attitudes which are mentioned separately in order to emphasize them. For purposes of this study, the term "Affective Attitudes" will therefore be used synonymously with the term "Affective Entry Characteristics."

The area of affective attitudes, although loosely defined and often variously labled, is of considerable concern to a variety of educators. It is most often dealt with as a concern of persons seeking to improve the process of learning and instruction. Gronlund (1976) advocated the

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area of affective attitudes as having an important place within the formative evaluation of students.

2.5 Aspects of Affective Entry Attitudes

The area of a student's affective entry characteristics has been demonstrated by Bloom (1976) to be important in the student's academic achievement or lack thereof, in a course of study. He discusses three dimensions which he hypothesises as composing a student's affective entry characteristics: attitudes toward subject, toward school, and toward self.

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The comparison between studies, even if limited to a single dimension, such as subject-related attitude, is still complicated by differences in research instruments. Bloom acknowledged that he was "fortunate that similar methods were used in the International Study of Educational Achievement studies in such subjects as mathematics, science, literature, reading comprehension, French as a second language, and English as a second language" (Bloom, 1976, p 81). This is not however the usual case. More often, attitude research methods are common only in the basic attitudes that they attempt to measure.

According to Bloom, while generality is desirable for comparison purposes, what most researchers are interested in is the specific dimension of subject-related attitude. The

choice of dimension or dimensions to be researched can be determined by comparing their utility values with the amount of work required to measure them.

Bloom (1976, p 97) found that in general the best predictor, of the three dimensions, produced as good a prediction of academic achievement as the combination of two or all three could produce. If, then, the best predictor alone could be measured, as good results would be achieved with only one third of the measurements as with all. The problem then becomes one of choosing the best dimension. Bloom went further and determined that while they are separable dimensions at the lower grade levels, they merge into a single generalizable characteristic in the later years. By the time a student would reach the level of vocational or technical education an attempt to measure one dimension would actually elicit a response in all three dimensions. If a measure of any one dimension would elicit this three dimensional response then the measurement of any one dimension should provide an equivalent measure of the student's affective entry attitude.

Within the dimension of subject-related affect, Bloom considers the three important areas percieved by the student to be the past history, the present task, and the goals of the future.

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2.6 Achievement Motivation

Other researchers have also studied the relationship of affective attitudes and achievement by studying affective attitudes through some dimension or component of these attitudes. By singling out a dimension or component it is often easier to produce a more generally applicable instrument.

One component of affective attitude, motivation, has been studied in conjunction with achievement. McClelland (1953, p 80) advances the theory that a person will work towards achieving a goal so long as there is a difference between the person's current level of achievement and the level of the goal. A student's goal in a course is determined from expectations resulting from a number of other components of the student's affective attitude. "Clearly the expectations are built out of universal experiences with problem-solving - with learning to walk, talk, hunt, read, write, sew, perform chores, and so forth." (McClelland, 1953, p 78) Achievement motivation can be made to help students work towards mastery of various skills. The task for the educator, according to this theory, is to ensure that the student's expectations of mastery are the same as those defined by the course objectives. Mere verbal acquiescence to the course objectives is not enough. As already pointed out, the student will set his own

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internal expectations of what mastery is for him. The educator, therefore, should be monitoring the student's level of motivation in order to determine when additional expectations need to be encouraged. However, Evans (1971) notes psychologists have produced surprizingly little that aids the teacher either in recognizing or changing motivations.

From the various works on motivation there is a concensus that motivation includes specific directions. McClelland attempted to correlate general measures of achievement motivation to scholastic achievement. From his poor results he concluded, "Possibly it is necessary to introduce cues relating to the task for which achievement predictions are being made in order to get a measure of n Achievement which will predict scores for that task." (McClelland, 1953, p 238). It appears that any measurement of a student's affective attitudes, in a course, should be made of attitudes with regards to the student's course of study in particular.

McClelland identifies two possible causes of achievement motivation, "the organism seeks to maximize pleasure and minimize pain" (McClelland, 1953, p 93). He links the maximization of pleasure with the motivation to succeed. Thus a student in a course of study freely chosen, and especially in the student's major area of interest and

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study, should be primarily motivated to succeed. McClelland also links the minimization of pain with the avoidance of failure. Thus a student in a required course of study may be motivated only to avoid failure. Both positive and negative feelings towards an activity can provide achievement motivation. These two causes of motivation act together in varying amounts to produce the observed achievement motivation. The maximization of pleasure produces a positive correlating acheivement motivation and the the minimization of pain produces a negative correlating achievement motivation.

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2.7 Measuring Affective Attitudes

The measurement of affective entry attitudes provides a much greater difficulty than the measurement of cognative entry behaviors. This is due to the highly subjective nature of the affective domain. Because affective entry attitudes vary from course to course, it is difficult to find a suitable initial test. Because of possible side effects arising from the first use of such a test, it is even more difficult to find one that can be reused.

A number of generalized attitude tests have been developed for evaluating the affective domain. These methods include:

(1) observing the pupil as he performs and describing or judging his behavior (evaluating a

> speech), (2) observing and judging the quality of the product resulting from his performance (evaluating handwriting), (3) asking his peers about him (evaluating social relationships), and (4) questioning him directly (evaluating expressed interests). (Gronlund, 1976, p 247)

Each of these methods have a variety of disadvantages as they are currently used. Gronlund points out that they are more subjective than we would like, and that they are usually quite time consuming. In comparison to generalized intelligence tests, they are less reliable and yet more difficult to use. The problem is that "they provide the best means available for evaluating a variety of important behaviors." (Gronlund, 1976, p 248)

The two most common standardized projective attitude tests are the Rorschach Inkblot Test and the Thematic Apperception Test (TAT). They both require highly trained individual scorers working one on one with the subjects. Due to their extremely general nature, which allows almost complete freedom of responses, they would be of little value in determining a student's affective attitude within a particualr school course. Although the Thematic Apperception Test has been used in the study of achievement motivation, its use has remained within the general nature of clinical diagnosis.

As an educational alternative to these overly general tests, Gronlund proposed the development of standardized

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interest inventories. He stated that inventories have generally been used only for guidance purposes but that they also contained potential for use in curriculum planning and instruction.

The use of standardized interest inventories would allow more direct and objective testing. It would also be more feasible than the more time consuming alternative of personal interviews.

Standardized interest inventories would still provide the educator with very generalized results. The problem would still be to relate these results to the student's affective attitudes towards the particular course. Due to the variety of attitudes involved in various courses, this might lead to the development of specialized interest inventories for each course. This poses an additional problem as old courses change and as new courses are developed.

The development of specialized affective attitude tests for particular courses poses even greater problems of reliability and validity than that of generalized attitude tests or specific cognitive tests. There is no easy method of determining what should go into a specialized affective attitude test or how to ensure that its wording does not improperly influence its results.

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2.8 The Semantic Differential

Various methods of attitude measurement are discussed by Oppenheim (1966). Of these, the semantic differential technique appears to be of particular potential in the development of a common and generalizable instrument for measuring affective attitudes. This potential is due to the ability of a semantic differential to use general pairs of semantic opposites, taken from the common, ordinary vocabulary of everyday society, as a rating scale.

The semantic-differential technique was originally originally developed by Charles E. Osgood (1957). It uses a number of semantic opposite pairs of adjectives that are connected by a seven-point rating scale. Concepts are rated by a number of scorers on each scale. The result of a factor anlysis of a number of such ratings is found to be three major dimensions that are aligned with the concepts of evaluation, potency and activity.

This idea of the dimensions of connotative meaning is described by Osgood (1957) to be a "semantic space". He assumed that this semantic space could be dealt with in Eculidian terms. All concepts and all words should be contained within this semantic space. Words can then be located according to the coordinates of their connotative meaning. Semantic differentiation provides a tool for allocating such coordinates to words.

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2.9 The Semantic Differential in Education

The development of the semantic differential technique for use in education was advocated by Maguire (1973).

Further investigation reveals that the semantic differential technique has been used in studies of various specific areas of educational interest. Some of these areas serve as examples of the dimensions of affective entry attitudes already discussed.

The dimension of attitude towards subject was investigated by McCallon and Brown (1971). They compared the results of a semantic differential instrument with a Likert type attitude instrument that had been previously validated by Aitken and Drager (1961). They found a correlation of .9 between the two and concluded the semantic differential instrument to have concurrent validity with the other instrument. They found the evaluative dimension of the semantic differential to be of particular significance and noticed that people posessing favorable and unfavorable attitudes towards the subject of study differed to the greatest extent on evaluative scales of the semantic differential. This lent construct validity to their use of the semantic differential.

A study by Cassel(1970) used a semantic differential to measure the attitudes of students towards the concepts of

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school, teacher and student. Here the concept of student is akin to the student's concept of self within the school environment. Both the concepts of school and self have been identified as dimensions of a student's affective entry attitude. A comparison of pre and post course attitudes showed a significant change for the concept of student. This change might be attributed to the effects of the course on the students.

2.10 Semantic Differential Measured Changes in Attitudes Throughout a Course

There are a number of educational situations which contain affective as well as cognitive and psychomotor behavioral objectives. This is especially the case in the areas of vocational and professional education, in which students are being prepared to fit into the world of work. Simpson (1978) noted that the attitudes and values that students gain in a professional program are among the most important of all educational outcomes. The practice of these attitudes and values will be an important component of their functioning as professionals on the job.

Hover and Schultz (1968) studied the intentional change in students' attitudes produced by a college course. They assumed that "attitudes are learned predispositions to respond in an evaluative sense." (p 300) A major concern was finding a reliable attitude measuring

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instrument that would be sensitive enough to register subtle attitude shifts. Of the various instruments available they felt that the evaluative dimension of the semantic differential seemed ideally suited for the purposes of their study. They constructed a thirteen concept semantic differential scored instrument that was administered both before and after the course. Significant attitude shifts were obtained on ten of the thirteen concepts. The lack of significant shifts in the other three concepts could be explained by an analysis of the course content.

2.11 Semantic Differential Dimensions

The semantic differential technique, developed by Osgood (1957), has had three major purposes. The first is to investigate the nature of semantic meaning. The second is to provide a technique for structuring attitudes. The third is to investigate attitudes towards various concepts via the semantic meanings accociated with these concepts. The educational applications, discussed above, have attempted to serve the third purpose.

In his investigations of semantic meaning, Osgood (1957, 1962) found that factor analysis of various semantic differentials consistently yielded the majority of loading on three factors which could be identified as "Evaluation, Potency, and Activity". He found, from a number of studies, that the factor loadings of semantic space are general

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across cultural boundaries (Osgood, 1962, p19).

Tzeng and May (1975) conducted further research into the factor analysis of semantic space. They analyzed data from semantic differential instruments with enough semantic opposite scales to produce six significant factors. The first three factors, in order of loadings, that they found were the usual evaluation, potency, and activity. By comparison with the second three, they found these first three factors to "exhaustively represent the affective semantic space" (1975, p 103). The fourth factor they found to be "predictability" as represented by semantic pairs such as stable / unstable, certain / uncertain, and true / false. They found the fifth factor to represent "concreteness" as opposed to abstractness. The sixth factor they identified as "immediacy". They concluded that these second three factors were components of a non-affective space that they identified as denotative space (1975, p 109).

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2.12 Generality and Reusability for Affective Measuring

The considerations of validity and reusability of a measurement instrument depend upon the interaction effects caused by the instrument design and composition. These interactions can occur within the instrument, effecting its validity or between successive administrations of the instrument effecting the reliability of its reuse. If fewer words are used in the instrument questions then there are

fewer words that could unintentionally influence the responses to the instrument. Oppenheim (1966) suggests that to carry this concept to the ideal we would have to eliminate asking any questions at all. Such a case is, however, both impossible and impractical.

By using scales composed of words from common vocabulary, the semantic differential technique can reduce the effect of questioning in the elicited response. It does so by minimizing the number of potentially leading words in the questioning process. There is, however, a further level of refinement possible for the reducing of the effect of questioning. This is, of course, to ask an open ended question such as, "Tell me what you think about X" where X is the object of the attitude under investigation. In order to use this method, it is generally accepted that a complex scoring procedure is required.

> Less fluent subjects, however find it very difficult to encode meanings spontaneously (in a taste test on brands of ice cream one of the authors found that most subjects could produce "creamy", "tasty" and a few other terms, but little more, yet given a form of semantic differential these same individuals quickly and confidently indicated a large number of judgments). But what spontaneous linguistic output may gain in validity and sensitivity, it certainly loses on other grounds - introspections are hardly comparable and do not lend themselves to quantification. What sort of quantitative index of meaning could be applied to the two sample outputs above? (Osgood, 1957, p 19)

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In scoring open ended questions it is necessary to minimize the problems of differences in fluency and size of vocabulary of subjects. The problem of fluency can be minimized by various types of controls on the sample of words. Such controls can be directly or indirectly on the number of words or by comparing only subjects of similar fluency. Indirect controls on number of words can be produced by limits of time or space for answering. Furthermore, subjects can be asked to write a set number of words or to fill the space provided. They can also be asked to write as much as possible in their answer. Some of these methods can be seen to require instructions, which may cause additional interference in the answering process. The methods of limiting time or space are therefore preferable, provided that all the responses elicited are still of a suitable size. The problem of size of vocabulary requires that the scoring mechanism must be geared, especially, to words with the greatest frequency of use in the common language.

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2.13 The Association of Words and Attitudes

Linguistic theories propose that the words used in a description have a connotative, as well as a denotative, meaning. The connotative meaning is a result of the attitudes of the person choosing the words for the description. According to Ogden and Richards (1923) these

attitudes may be both conscious and unconscious in nature. Thus the indirect expression of attitudes also may not be obvious to someone analyzing a group of words. Thus words often convey a greater amount of meaning than they appear to convey.

The effect of attitudes on choice of words can be seen to be a case of the stimulus response process, where the attitudes provide the stimuli and the words chosen provide the responses (Osgood, 1957, p 4). The words chosen come from a person's vocabulary which is a set of possible conditioned responses. A person's vocabulary is built of a number of words which have been frequently associated with similar experiences. These experiences, that are associated with the words, will have been similar in both connotative and denotative context. Thus, one should be able to measure attitudes indirectly via the use of words associated with them.

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2.14 A Universal Semantic Dictionary

The basis for an attitudinal scoring system for open ended questions was first suggested by Osgood (1957). At that time, he proposed that, if semantic differentials could be shown to apply cross-culturally (which he later proved), then a semantic dictionary could be composed of the semantic scores of words. In the semantic dictionary, words would be listed according to their locations within the dimensions of

semantic space. His intent at that time was to select the desired semantic dimension scores and then to find the word which best fit the intended attitude. This process could, however, be reversed to select a word and then to find the intended attitude. By using a suitable semantic dictionary it, therefore, should be possible to analyze the attitudes contained in an essay on a word by word basis. The main attitudes contained in the essay should be represented by the average attitude of the words in the essay.

A sizeable semantic dictionary was compiled by Heise (1965). He used a semantic differential study containing 1000 of the most frequently used English words. The words were selected on the basis of frequency of use as listed by West (1953). Service words such as articles and prepositions were excluded since pilot work had indicated that they had neutral semantic ratings. A larger semantic dictionary, of 1551 words, was compiled by Heise (1978) by consolidation of his earlier dictionary with those of Jenkins (1958) and Snider (1969). Heise has suggested that by scoring statement words which occurred in the dictionary that a representative score for the statement could be determined. "In research focusing on subjects' verbal behavior, one need not consider all words emitted but only representative samples" (Heise, 1965, p 2). Heise's 1978 dictionary is the largest semantic dictionary available for current use. The next largest, his 1965 dictionary, is a subset of it.

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2.15 Applications of a Semantic Dictionary

Recently, Anderson and McMaster (1978) devised a computer program that would automatically score passages of text using Heise's (1965) semantic dictionary. They have applied this to "the analysis of excitement in literature" with considerably successful results. In their study, they scored successive 100 word segments of text. They calculated average evaluation, potency, and activity scores of all scorable words for each segment. They found the average scores to be representative of the relative levels of evaluation, potency, and activity that occurred within the segments. They found this technique capable of an accurate analysis of attitudes of a variety of types of written materials, both prose and poetry. While Anderson and McMaster only report on the use of their program in the descriptive sense, they do suggest that it could be used predictively for educational applications, such as the selection of appropriate text books based on their emotional effects on the students.

Heise (1978) described a method of using a semantic dictionary in predicting actions in interpersonal situations. He wrote a computer program that would evaluate situations with the aid of a semantic dictionary. Given a description of an actor and a person to be the object of the the action, the computer program suggested a number of

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likely actions in keeping with the descriptions of the personalities involved. Once an act is chosen, the program will then predict the effect upon the people and whether the effect will be permanent or transient.

2.16 Implications of a Semantic Dictionary

The above methods suggest that a semantic dictionary can be of use in measuring the attitudes contained in groups of words. The Anderson and McMaster study suggests that the source of the attitudes need not be tested in the traditional manner. Rather than asking questions of the authors of the passages that they measured, they based their measurements on actual output of these people in a nontesting environment. Heise (1978) suggests that a person's attitudes towards someone or something can be measured from the words that the person chooses to describe the other person or thing.

These findings are in agreement with the linguistic theory previously discussed. They show that the indirect representation of attitudes produced through the choice of words both exists and can be measured. The means of this measurement, the semantic dictionary, is of such a general nature that it should also work in other situations.

The one situation, of particualr interest here, is the measurement of students' attitudes towards their courses. A

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general, open ended attitude measuring instrument should be able to provide this measurement when scored by a semantic dictionary. This would be a considerable improvement in flexibility and generality of attitude measuring, as has been previously discussed. These measures have uses both descriptively and predictively in educational applications. The Anderson and McMaster (1978) study supports the descriptive usage and the Heise (1978) study supports the predictive usage of this methodology.

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Chapter III

3.0 METHODOLOGY

It was the purpose of this study to investigate a method for measuring students' affective attitudes. The attitude measures were then correlated with the students' achievement.

Students were required to write essays dealing with their past, present and proposed future attitudes towards their subject of study. These essays then were scored to to determine a series of measures of the students' attitudes. Students' essays were scored by calculating the average semantic scores of all words in each essay that were also included in an available semantic dictionary. Three educators were also asked to score the attitudes contained in each essay. This was to provide a reference for comparison purposes. The various attitude scores were correlated with student course grades.

3.1 Research Instrumentation

The study used a research instrument developed by the researcher, a series of computer programs written by the researcher, and the achievement scores provided by NAIT.

The research instrument consisted of three pages with a research question at the top of each as well as space for

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individual student identification. There was also a cover page which asked for student id and course name. The form of individual student identification was the NAIT student id number, in order to protect student privacy. The three questions asked the student to write a short essay each, in nontechnical language, about his concept of the subject of the course in past, present, and future contexts.

The three research questions used were:

a) Please describe in essay form and without needing to go into technical details what you already know about the subject of this course.

b) Please describe in essay form and without needing to go into technical details what you think you are going to learn in this course.

c) Please describe in essay form and without needing to go into technical details how you plan to use the knowledge gained in this course in your future.

Achievement scores for the students in the courses and their prerequisite courses were obtained from the departments responsible for the courses at NAIT.

3.2 Semantic Dictionary Computer Scoring Programs

The research methodology was designed to determine the

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validity and usability of computer produced semantic attitude scores of essays. A computer program scored each essay by calculating average evaluation, potency, and activity scores of scorable words within the essay. It also produced a composite semantic score from these three scores.

The computer programs written were similar in nature to those developed by Anderson and McMaster (1978). They scored an essay by calculating the average semantic co-ordinates of words from the essay that appeared in the semantic dictionary compiled by Heise (1978).

A set of two programs was used. The first program searched the essays for words that were listed in the semantic dictionary as having more than one meaning, such as the word "act" which can be a noun or a verb. When such a word was found, the program printed the word, the line the word occurred in and the possible uses of the word. This listing of occurrences of multiple meaning words was then analyzed by the researcher to determine the correct choice of meaning from the context of usage. A listing of selected meanings was then coded to provide clarification to the second program. The second program searched the essays for all words that were listed in the semantic dictionary. Where it encountered multiple meaning words, it consulted the list of selected meanings to choose the correct one. The program then took the evaluation, potency, and activity scores from

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the semantic dictionary for each of the words it had found. It added these three scores to group totals for the essay. The program also kept track of the number of words scored. At the end of the essay, it calculated the average score for each of evaluation, potency and activity. It also calculated a composite score from these three averages. Finally, it prints out the essay identification, the three average scores and the composite score, as its results.

3.3 Educator Scoring

Three educators were asked to score each essay on the basis of the quality of attitudes contained in them. This quality of attitudes was defined as the positiveness or negativeness of the attitude of the essay towards the school subject described in it. The rating was to be on a scale of 1 to 99, with 99 being the most positive attitude. The essays were provided on computer printouts with a unique code number assigned to each essay. The essays were grouped by school subject, and sorted by research subject (student). Pretest essays were placed before posttest essays, where both essays were produced by a research subject. The exact method of rating was left up to each scorer, in order to replicate typical conditions within the educational system. Each scorer, however, was instructed to devise some method that could be consistently applied by him to scoring of all the essays before he actually started scoring them.

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Educators were used as scorers to provide evaluations for comparison purposes because, at the current time, most educators go no further in assessing student attitudes than using what insights they themselves gather. According to Evans (1971) and Gronlund (1975) the use of more sophisticated attitude measuring methods, is rare. It is admitted that additional information may be obtained, over the duration of a course, which will reflect the attitudes of some of the students to a greater extent. This will be especially true where a high degree of interaction occurs between a student and the instructor.

The three members of the University of Alberta educational community, who were chosen, represented a wide variety of experience backgrounds. They were chosen from among the colleagues of the researcher on the basis of the diversity of their experience. Scorer 1 was a third year undergraduate education student who had completed his practicum requirements. He was chosen to represent new teachers with relatively little experience. Scorer 2 was a graduate student in the Department of Industrial and Vocational Education. He had over twenty years of experience teaching industrial arts and vocational education at high school and community college levels. He was chosen to represent experienced teachers. Scorer 3, the researcher, was a graduate student in the Department of Industrial and Vocational Education. He has not taught

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traditional school courses but had worked in industry as a consultant and industrial trainer for over five years. He was chosen to represent persons with industrial experience who move into vocational and technical education.

3.4 Statistical Research Design

The methodology for determining if the proposed method measures affective attitudes consisted of correlating the results of the computer semantic scores with the results of the attitude scores of the three educators.

The methodology for determining if the proposed method was educationally descriptive consisted of correlating the results of the attitude scores of essays with the students' current achievement scores. Correlations were calculated using both computer semantic scores and educators' attitude scores as attitude scores of essays. The attitude scores obtained at the start of the course, were compared with the final achievement scores from the prerequisite course. The attitude scores obtained at the end of the course were compared with the final achievement scores of the current course.

The methodology for determining if the proposed method was educationally predictive consisted of correlating the attitude scores obtained from the research instrument that

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was administered at the start of the course and the final achievement scores of the current course. Correlations were calculated using both computer semantic scores and educator attitude scores of essays.

Each of the above methods was tested for each of the three courses comprising the sample population. The generality of the proposed method was then determined by comparing the results between all three courses. The correlations of educational descriptiveness obtained from each of the three courses was compared to determine if the proposed method was educationally descriptive in general. The correlations of educational predictability obtained from each of the three courses were compared to determine if the proposed method was educationally predictive in general.

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All analyses using scores from the research instrument used the average score on the entire instrument. Scores for the proposed method included evaluation, potency and activity scores as well as a composite score. The composite score was composed of the vector distance from the co-ordinates (-3,-3,-3), which is the most negative possible point in the semantic dictionary that is being used. The formula for computing the composite score is:

$$C = ((E + 3)^2 + (P + 3)^2 + (A + 3)^2)^{1/2}$$

where C is composite score, E is evaluation score, P is potency score, and A is activity score.

3.5 Pilot Studies

The effectiveness of this method of analyzing attitudes, shown by both Anderson and McMaster (1978) and Heise (1978), was accepted. Their methodology of scoring was very similar to the methodology used in this study, thus no pilot study was done in the use of the methodology.

The main area of concern was the wording of the research instrument. It was to elicit three answers, each of at least a hundred words (in order to give a large enough sample of words to be scored). The answers should describe the respondents' past, present and future oriented concepts of the school subject being described by them. The research instrument needed to avoid frustrating its respondents. These two concerns were pilot tested by administering it to a group of ten undergraduate university students enrolled in industrial arts technology classes in the Department of Industrial and Vocational Education at the University of Alberta. This group was chosen because of ease of access for testing and because they approximated the research population in age and technological background.

In the pilot study the research subjects were told:

> This is a study designed to investigate your ideas and opinions towards the subject of this course (course title filled in here). It has no bearing on your grade in this course. It will be used in attempting to improve this course.

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The study is composed of three questions. They are: what do you already know about the subject of this course; what do you think you are going to learn in this course; and how do you plan to use the knowledge gained in this course in your future.

It is important that you answer each of the three questions as fully as possible. You will have fifteen minutes to answer each question. Please spend all of the time allocated to each question in writing your answer. Do not go ahead to the next question until you are told to do so.

Thank you for your co-operation.

Before begining please put the course name and your student id number on the cover page.

(pause)

Please begin the first question now.

(after fifteen minutes)

Fifteen minutes are up. Please begin the second question now.

(after thirty minutes)

Thirty minutes are up. Please begin the third question now.

(after fourty-five minutes)

Fourty-five minutes are up. Please hand in your papers. Thank you, again, for your co-operation.

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The pilot study determined that the written questions were successful but the oral instructions required a slight revision. The average length response to the research instrument, in the pilot study, was 342 words, with 278 words the minimum and 456 words the maximum. This size of response was deemed to be more than adaquate, since Anderson and McMaster had successfully used 100 word segments.

The time element was found to be excessive. The majority of students were finished the questions in less than 8 minutes per question. The excess time either caused them to be impatient or to disregard their instructions and to go ahead and work on the next question. In reading the

responses, it was found that the responses to individual questions often actually dealt with all three questions, past, present and future, together. In some cases, references were made to a previous question's response. One student even answered all three questions together, without any attempt at providing separate answers. Since the study had not planned to do separate investigations of attitudes for each of the three questions, and since the responses had been satisfactory in length and content, it was decided to modify the verbal instructions to eliminate the need for waiting to start the next question. Specific time periods had been originally used in hopes of extending the length of each reply. This had not occurred, and since adequate responses had been produced, it was found unnecessary. The time limit was also revised to a maximum of thirty minutes in total.

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3.6 Selection of Subjects

The population for this study consisted of the students enrolled in vocational and technical programs at NAIT.

The sample consisted of the students enrolled in three classes within the population. Three classes from the vocational and the technical areas were chosen, subject to availability, by the Division of Research and Academic Development at NAIT to provide this sample.

3.7 Field Procedures

The research instrument administered had three distinct questions. Each question required some amount of writing on the part of the students. Once started, students were allowed to proceed through the questions at their own speed.

The administration was preceded by an introduction to the study, basic instructions and the distribution of the research instrument. The study was described in general terms in order to avoid biasing the responses. In the study the research subjects were told:

> I am a graduate student in the Department of Industrial and Vocational Education at the University of Alberta. I am investigating the opinions of NAIT students towards some of their courses. I am here today to ask you a few questions about this course (course title filled in here). I would like you to write your answers on this questionnaire I am handing out.
>
> This is a completely confidential study. Your instructor will not see your written answers. Only a general summary of the class's answers will be available to him. I do ask that you identify yourselves on the cover page of the questionnaire. This is to be able to compare your answers from the start and the end of the course only. I do not require your name, therefore, but only your student id number.
>
> The study is composed of three questions. They are: what do you already know about the subject of this course; what do you think you are going to learn in this course; and how do you plan to use the knowledge gained in this course in your future.
>
> It is important that you answer each of the three questions as fully as possible. You will have half an hour to answer these questions. I will write the time on the blackboard every five minutes and tell you the time every ten minutes. This will help you to pace yourselves.

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Thank you for your co-operation.
Before begining please put the course name and your student id number on the cover page.
(pause)
Please begin now.
(after ten minutes)
Ten minutes are up.
(after twenty minutes)
Twenty minutes are up.
(after thirty minutes)
Thirty minutes are up. Please hand in your papers. Thank you, again, for your co-operation.

3.8 Data Collection

Data for the achievement grades for the courses and their prerequisites were obtained from the departments involved at NAIT.

Raw data consisting of the students' essays were written on the research instrument. These were then entered into the computer for analysis.

Data for the affective scoring came from the semantic dictionary compiled by Heise (1978) which were entered into the computer.

Scorers were given computer printout copies of the essays along with essay code numbers. They returned sheets with the essay code numbers and their corresponding attitude evaluation scores.

3.9 Methodological Assumptions

Tests of significance used $p = .05$ as the level of

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rejection. Correlations were determined using Pearson's r. Composite correlations, from multiple samples, used Fisher's Zr.

Some attrition was expected during the course of the study. Correlations were calculated excluding missing data

It is assumed that the research sample honestly responded to the research instrument.

It is assumed that the method of administration of the research instrument did not bias the responses to it.

3.10 Limitations

Not all NAIT vocational and technical classes were available for use in the sample. Thus the sample was not randomly selected.

The semantic dictionary compiled by Heise (1978) only has two significant digits compared with that of Heise (1965) as used by Anderson (1978), which has three three significant digits. It was chosen, however, because of its greater number of words.

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Chapter IV

4.0 Findings

Three classes were provided by NAIT as the research sample. There were 72 students (44 male and 28 female) in the study. The average age of the sample was 22 years. A description of each course is given below.

Some differences between courses may have had an actual permanent effect on the attitudes of the students towards the subject of study. Other differences between courses may have only effected the way the students perceived the particular class or instructor. Differences of the second type might have served as a source of contamination to the attitude evaluation performed by the educators who served as scorers in this study. It is important to distinguish between those differences which actually had an effect on the attitudes and those which which might have only had an effect on the attitude scores. Differences in teachers, and thus in teaching styles and in effectiveness of instruction, may be expected to account for some differences in the attitudes of the students. Other differences noted, might not be significant differences within the students but only temporary modifications in their modes of expression within their classes. Since attitude modification of the students was not an explicit objective of any of the courses, one would

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not have expected large overall change in the average of the students' attitudes according to Hover and Schultz (1968). This finding was confirmed by very small changes in average class semantic scores over the duration of the courses. The Educators' average class scores showed considerable changes over each of the classes. This might tend to support the theory of the greater reliability of the semantic attitude scores. It also suggests that the Educators' scores might be measuring different things.

The differing reasons students had for taking the the courses may have influenced their attitudes. These differences will be discussed in relation to the results for each course.

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4.1 Findings in a Computing Course

One course used in the study was entitled "Computers in Business". For a short form, it will henceforth be referred to as the computing course. The computing course was targeted to serve vocational students within NAIT's business program. This particular class was held in the evening and therefore contained part-time as well as full-time students.

The computing course was a second year level course that was an option in the business program and had been chosen by the students. it is expected that the students

were interested in the computing course but not necessarily as committed to it as if it had been their major subject. Because the students chose it as an option and thus showed interest in it, the students should have a positive attitude towards the course. Since it is only an option, the students might have only a low level of achievement motivation towards the course.

The research instrument was administered at the start of a class period at the end of the first week of classes and again during the last week of classes. The instructor left the room both times before the research instrument was administered. On the latter occasion, the class repeatedly asked for assurances that the instructor would not see the results. They implied that they were very unhappy with the instructor of the class.

The class, and thus the sample, experienced a fairly large attrition rate of 5 out of the original 15 students. Of the 14 students who both had a prerequisite grade and completed the first research instrument, 5 were male, 9 were female and the average age was 27 years. Of the 9 students who both had a final grade and completed the second research instrument, 3 were male, 6 were female and the average age was 28 years. Of the 10 students who both had a final grade and completed the first research instrument, 4 were male, 6 were female and the average age was 28 years.

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The mean prerequisite grade for the computing students was 78.7. Their mean final grade was 77.8. The The prerequisite grade had a Pearson's r correlation of +.80 with the final grade which is the same as was reported by Bloom (1976).

Table 1 shows that the student average attitudes towards the subject of computing have significantly dropped over the period of the course according to all three of the educators. Slight drops in attitude scores were also calculated from the semantic dictionary scores.

Table 1

Attitude Means in Computing

	Start of Course n=15	End of Course n=9	Change n=9
Semantic Dictionary Scores			
Evaluation	1.13	1.12	- .01
Potency	.70	.69	- .00
Activity	.63	.60	- .02
Composite	6.63	6.60	- .02
Educators' Scores			
Educator 1	86.7	57.4	-25.4 *
Educator 2	67.3	58.3	- 7.8 *
Educator 3	77.3	67.2	-11.1 *
Average of Educators	77.3	61.0	-14.9 *

* significant differences at the p=.05 level

The differences in attitudes between the start and the end of the computing course, that were perceived by the educators, may have been due to the overall impression that

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the course failed to meet the students' expectations. At the start of the course most students expressed definite goals for the course. "Since my job is in methods, I hope that I will learn from this course a better understanding of when a computer can be used to improve a procedure." (Student 1 at the start of the course) By the end of the course, the majority of students expressed disappointment at the course not having met their goals. "I know very little more now about the subject than I did at the begining of the course." (Student 1 at the end of the course)

4.1.1 Semantic Dictionary Attitude Measures in Computing

The null hypothesis that "the scoring of the research instrument does not correlate with the affective attitude of the students towards the subject of study" was investigated in the computing course. Correlations were calculated between educator produced scores of the students' attitudes contained in the research instrument and the semantic dictionary produced scores of the same research instruments.

There were no significant correlations either at the start or at the end of the course. Therefore the null hypothesis cannot be rejected for the computing course. These correlations can be found in Appendix A.

Correlations then were calculated between the various educators' scores. Tables 2 and 3 show that the majority of

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these correlations were significant. The low values of the intereducator correlations indicate that the educators' scores are unreliable. This may account for the poor correlations between the educators' scores and those produced by the semantic dictionary. The correlations seem better at the end of the course, perhaps the practice helped.

Table 2

Correlations Between Educators
at the Start of the Computing Course (n=15)

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000 *	.606 *	.222	.849 *
Educator 2	.606 *	1.000 *	.060	.717 *
Educator 3	.222	.060	1.000 *	.610 *
Average of Educators	.849 *	.717 *	.610 *	1.000 *

* significant at the p=.05 level

Table 3

Correlations Between Educators
at the End of the Computing Course (n=9)

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000 *	.724 *	.579	.890 *
Educator 2	.724 *	1.000 *	.813 *	.926 *
Educator 3	.579	.813 *	1.000 *	.865 *
Average of Educators	.890 *	.926 *	.865 *	1.000 *

* significant at the p=.05 level

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The lack of significant correlations in the computing course also may be due to the mixed feelings of the students towards the course. As pointed out previously, most students brought their own particualr goals to the course. While all of these goals might have been equally strong motivators to the students, the educators may have valued them differently. At the end of the course there may have been strongly mixed feelings towards the subject. Students still felt positively towards the subject of computing but expressed negative feelings towards the course itself for not meeting their particualr goals.

4.1.2 Attitudes and Concurrent Achievement in Computing

The null hypothesis that "there is no correlation between achievement and concurrently measured attitude scores" was investigated in the computing course. Correlations were calculated between the semantic dictionary produced scores of the research instruments and the concurrent achievement grades. The semantic scores from the start of the course were compared with the achievement scores of the prerequisite course. The semantic scores from the end of the course were compared with the final achievement scores in the course. Similar correlations were calculated between educator made attitude scores and achievement scores for comparison purposes.

Table 4 shows that the one measure that is reliable in

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producing a significant correlation with achievement is the semantic evaluation score. Only one out of the three educators produced a significant correlation. That educator was Educator 1, the undergraduate education student, and he only produced a significant correlation on one of the sets of measures. These lower values of educator correlations suggest that the educators may not have been very reliable. this problem of educator reliability has also been noted previously.

Table 4

Concurrent Correlations Between Attitude Scores and Student Achievement in Computing

	Start of Course n=14	End of Course n=9	Both Times n=23 (**)
Semantic Dictionary Scores			
Evaluation	.462 *	.600 *	.535 *
Potency	.326	.290	.307
Activity	.250	.315	.282
Composite	.422	.529	.477 *
Educators' Scores			
Educator 1	.173	.688 *	.470 *
Educator 2	.047	.379	.219
Educator 3	-.034	.376	.178
Average of Educators	.034	.573 *	.330

* significant at the p=.05 level
** calculated using Fisher's Zr

The semantic evaluation correlations of .462 and .600 compare well and favorably with the average correlation of .500 between affective entry attitudes and achievement reported by Bloom (1976). The semantic evaluation score,

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therefore, appears useful as well as significant. The null hypothesis is rejected for semantic scoring on the evaluation dimension. The null hypothesis is not rejected for other forms of attitude measures studied.

4.1.3 Attitudes and Later Achievement in Computing

The null hypothesis that "there is no correlation between final achievement and attitude scores calculated at the start of the course of study" was investigated in the computing course. Correlations were calculated between the semantic dictionary produced scores of the research instrument from the start of the course and the final achievement scores. Similar correlations were calculated between educator attitude scores and final achievement scores for comparison purposes.

There were no significant correlations. The null hypothesis cannot be rejected. These correlations can be found in Appendix A.

One factor contributing to the lack of significant correlations could be the level of achievement motivation present. As pointed out, this course, being an option, should have a lower level of achievement motivation than either a course in the major area of interest or a compulsory course. Another possible factor for the lack of significant correlations is the small sample size of only

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9 students. It is generally difficult to obtain significant correlations with such a small sample

4.2 Findings in an Electronics Course

The second course used in the study was entitled "Electronics II". The electronics course was targeted to serve NAIT's electrical engineering technology students. This class was a regular daytime course composed of full time students

The electronics course was a second term course that was in the major area of study in the students' two year diploma program. It is expected that the students were both interested in and committed to the electronics course since it was their choice for their future career. The high level of interest, expected in the course, should indicate a positive attitude in the students towards the course. Because of their commitment to the subject as a future career, the students should have a high level of positive achievement motivation towards the course. A significant positive correlations between attitude measures and achievement would support this expectation.

The research instrument was administered at the end of the first week of classes and again during the last week of classes. The first time the research instrument was administered was during a "free" period where students were

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requested to attend. The second time the research instrument was administered was during a class other than the electronics class. Thus both administrations of the research instrument were outside of the normal class conditions. Only 8 out of 26 participated in both administrations. An instructor was present during the first administration but was not the instructor of the electronics course.

There were 16 students who both had a prerequisite grade and completed the first research instrument. This sample also remained in the course to obtain a final grade. There were 18 students in the sample who both had a final grade and completed the second research instrument. All samples were 100 per cent male and had an average age of 20 years.

The mean prerequisite grade of the electronics students was 66.1. Their mean final grade was 67.7. The prerequisite grade had a Pearson's r correlation of +.85 with the final grade which compares favorably with the +.80 reported by Bloom (1976).

Table 5 shows that the student attitudes towards the subject of electronics have significantly increased over the duration of the course according to Educator 1. The attitude scores of Educator 3 and the average of the educators also increased. Slight increases in attitude scores were also calculated from the semantic dictionary scores.

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Table 5

Attitude Means in Electronics

	Start of Course n=16	End of Course n=18	Change n=8
Semantic Dictionary Scores			
Evaluation	1.09	1.12	+ .05
Potency	.68	.68	+ .06
Activity	.60	.62	+ .03
Composite	6.58	6.61	+ .08
Educators' Scores			
Educator 1	72.4	82.8	+ 8.9 *
Educator 2	58.4	63.6	- 1.9
Educator 3	71.3	75.0	+ 3.1
Average of Educators	67.5	73.8	+ 3.4

* significant difference at the p=.05 level

The differences in attitudes between the start and the end of the electronics course, according to the educators, may have been due to the instructor's bringing together of the subject's ideas into an interesting and applicable whole system. At the start of the course students expressed a desire to learn how to synthesize electronic theory into usable systems. "I think that I will be able to learn various electronic circuitry and how to put the circuits to use to be able to control whatever it is that i want to control." (Student 16 at the start of the course) They also expressed a desire to learn how to analyze existing systems. "I feel that I am going to learn how to design a small electronic circuit and also how to analyze how a certain circuit should work. I should be able to trouble shoot and

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have some idea of where the problem is without trial and error measurement et cetera."(Student 18 at the start of the course) At the end of the course there was a high degree of satisfaction that a previously unknown area had become understood and useful. "I now feel that I am comfortable with electronics. It is no longer a complete mystery to me and I can now make some sense out of it and realize how important it is in today's society. Electronics has become interesting and useful to me." (Student 16 at the end of the course) The usefulness of the course and the quality of the instruction were credited with producing the satisfaction. "Learning how these circuits work and how they may be used in industry I found quite interesting which in turn made me work harder at understanding these circuits. My marks have improved slightly but I enjoy electronics because it has been made more interesting. I think my instructor had a lot to do with making the course better." (Student 18 at the end of the course)

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4.2.1 Semantic Dictionary Attitude Measures in Electronics

The null hypothesis that "the scoring of the research instrument does not correlate with the affective attitude of the students towards the subject of study" was investigated in the electronics course. Correlations were calculated between educator made scores of the students' attitudes contained in the research instruments and the

semantic dictionary produced scores of the same research instruments.

Table 6 shows the correlations for the start of the course. All correlations were significant at the start of the electronics course. Table 7 shows the correlations for the end of the course. The majority of correlations involving the evaluation or composite semantic scores and educator scores were significant. Also the majority of all semantic scores had significant correlations with the average of the educators' scores.

Because the majority of the correlations between the educators' scores and the semantic dictionary scores, 24 out of 32, are significant, the null hypothesis is rejected for the electronics course.

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Table 6

Correlations Between Educator Scores and Semantic Dictionary Scores of Student Attitudes at the Start of the Electronics Course (n=16) *

	Educator Scores			
Semantic Dictionary Scores	Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.612	.700	.575	.667
Potency	.500	.602	.551	.585
Activity	.584	.551	.575	.595
Composite	.652	.711	.655	.715

* all correlations are significant at the p=.05 level

Table 7

Correlations Between Educator Scores and Semantic Dictionary Scores of Student Attitudes at the End of the Electronics Course (n=18)

Semantic Dictionary Scores	Educator Scores: Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.497 *	.289	.556 *	.559 *
Potency	.430	.163	.336	.388
Activity	.332	.288	.497 *	.461 *
Composite	.491 *	.301	.545 *	.557 *

* significant at the p=.05 level

Correlations then were calculated between the various educators' scores. Table 8 shows that all of these intereducator correlations were significant at the start of the electronics course. This parallels the significance of all of the correlations between semantic scores and educator scores at that time.

Table 8

Correlations Between Educators at the Start of the Electronics Course (n=16) *

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000	.764	.783	.961
Educator 2	.764	1.000	.728	.872
Educator 3	.783	.728	1.000	.891
Average of Educators	.961	.872	.891	1.000

* all correlations are significant at the p=.05 level

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Table 9 shows that the intereducator correlations, even where significant, were low at the end of the electronics course. This may account for the low number of significant correlations between the semantic scores and the educator scores at the end of the electronics course.

Table 9

Correlations Between Educators
at the End of the Electronics Course (n=18)

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000 *	.235	.485 *	.738 *
Educator 2	.235	1.000 *	.561 *	.781 *
Educator 3	.485 *	.561 *	1.000 *	.833 *
Average of Educators	.738 *	.781 *	.833 *	1.000 *

* significant at the p=.05 level

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4.2.2 Attitudes and Concurrent Achievement in Electronics

The null hypothesis that "there is no correlation between achievement and concurrently measured attitude scores" was investigated in the electronics course. Correlations were calculated between the semantic dictionary scores of the research instruments and the concurrent achievement grades. The semantic scores from the start of the course were compared with the achievement scores of the prerequisite course. The semantic scores from the end of the course were compared with the final achievement scores in course. Similar correlations were calculated between the

attitude scores and achievement for comparison purposes.

Table 10 shows that the semantic evaluation scores, the composite semantic scores, the average of educators' scores Educator 3's scores produce significant correlations at both times. The other measures produced a significant correlation only at one time. The combined correlation was always found to be significant. Most of the significant correlations, for the start or end of the course, compare well with the average correlation of .500 reported by Bloom (1976). The null hypothesis is rejected for electronics. The strong, significant, positive correlations support the expectation of a strong positive achievement motivation.

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Table 10

Concurrent Correlations Between Attitude Scores and Student Achievement in Electronics

	Start of Course n=16	End of Course n=18	Both Times n=34 (**)
Semantic Dictionary Scores			
Evaluation	.505 *	.394 *	.444 *
Potency	.493 *	.270	.387 *
Activity	.337	.389 *	.363 *
Composite	.532 *	.390 *	.464 *
Educators' Scores			
Educator 1	.291	.543 *	.425 *
Educator 2	.385	.436 *	.410 *
Educator 3	.693 *	.538 *	.623 *
Average of Educators	.439 *	.637 *	.545 *

* significant at the p=.05 level
** calculated using Fisher's Zr

4.2.3 Attitudes and Later Achievement in Electronics

The null hypothesis that "there is no correlation between final achievement and the attitude scores calculated at the start of the course of study" was investigated in the electronics course. Correlations were calculated between the semantic dictionary produced scores of the research instrument from the start of the course and the final achievement scores. Similar correlations were calculated between educator made attitude scores and final achievement scores for comparison purposes. These are contained in Table 11.

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Table 11

Predictive Correlations Between Attitude Scores and Student Achievement in Electronics (n=16)

Semantic Dictionary Scores	
Evaluation	.518 *
Potency	.527 *
Activity	.407
Composite	.572 *
Educators' Scores	
Educator 1	.388
Educator 2	.517 *
Educator 3	.718 *
Average of Educators	.539 *

* significant at the p=.05 level

Table 11 shows that the majority of the correlations are significant. The null hypothesis is therefore rejected for the cases of the evaluation, potency and composite

semantic scores and the scores of Educators 1 and 2 and the average of the educators. The strong, significant positive correlations support the expectation of a strong positive achievement motivation.

4.3 Findings in a Quantitative Analysis Course

The third course used in the study was entitled "Quantitative Analysis". It was targeted to serve vocational students in NAIT's business program. This class was a regular daytime course composed of full time students.

The quantitative analysis class was a second year level course that was compulsory in the students' two year diploma program, although it was not their major area of study. There is no implicit expectation that the students necessarily should be interested in or committed to a course which is required in this manner. These students, however, did have to succeed in this course because of its compulsory aspect. Since the course was not freely chosen as an option or as a major area of study, the expected attitude of the students towards it cannot be inferred. The compulsory nature of non-freely chosen courses suggests an emphasis on the avoidance of failure. Thus a negative achievement motivation towards the course might be expected. Strong, significant negative correlations occurring between the attitude scores and achievement would suggest this correlation and would be explained as resulting from a

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a strong, negative achievement motivation that was due to the students working hard to avoid failure.

The research instrument was administered at the start of a class period at the end of the first week of classes and again during the last week of classes. The instructor left the room both times before the research instrument was administered.

The class, and thus the sample population, experienced only slight changes in composition. These were basically due to attendance on the days the research instrument was administered. Of the 25 students who had a prerequisite grade and completed the first research instrument, 12 were male, 13 were female and the average age was 20 years. Of the 26 students who had both a final grade and completed the second research instrument, 12 were male, 14 were female and the average age was 19 years. Of the 23 students who had a final grade and completed the first research instrument, 12 were male, 11 were female and the average age was 20 years.

The mean prerequisite grade of the quantitative analysis students was 77.7. Their mean final grade was 76.7. The prerequisite grade had a Pearson's r correlation of +.73 with the final grade. This compares with the +.80 correlation reported by Bloom (1976).

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Table 12 shows that the student attitudes towards the subject of quantitative analysis have significantly dropped over the period of the course according to one of the three educators and the average of the educators. Sizable drops also were noted by the other two educators.

Table 12

Attitude Means in Quantitative Analysis

	Start of Course n=25	End of Course n=26	Change n=20
Semantic Dictionary Scores			
Evaluation	1.06	1.04	- .01
Potency	.68	.66	- .00
Activity	.58	.58	+ .01
Composite	6.55	6.53	- .00
Educators' Scores			
Educator 1	79.8	61.1	-20.2 *
Educator 2	63.8	58.3	- 4.8
Educator 3	77.0	72.7	- 3.5
Average of Educators	73.7	63.7	-10.0 *

* significant differences at the p=.05 level

The differences in attitudes between the start and the end of the quantitative analysis course, according to the educators, may have been due to the many expressions of the students losing confidence in the course's applicability. At the start of the course students expressed the interest in learning how quantitative analysis could be applied to their futures in business. "I feel that this course will give me a knowledge of mathematical relationships between factors that influence business decisions." (Student 43 at the start

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of the course) By the end of the course some students expressed the despair that they would not likely be able to apply it to their particular future. "I do not see very many actual uses for most of the information we have learned." (Student 43 at the end of the course) Other students said that the material would not be usable until the distant, rather than the near, future. "Since I am an accounting student I do not think i will be using much of this until I have gone up the ladder a little. I will be using this type of analysis when I am in a position to make decisions on major purchases, et cetera." (Student 69 at the end of the course)

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4.3.1 Semantic Dictionary Attitude Measures in Quantitative Analysis

The null hypothesis that "the scoring of the research instrument does not correlate with the affective attitude of the students towards the subject of study" was investigated in the quantitative analysis course. Correlations were calculated between educator scores of students' attitudes contained in the research instrument and the semantic dictionary scores of the same research instruments.

Table 13 shows that all of the correlations involving composite semantic scores or the average of the educators' scores were significant. The majority of the correlations with evaluation semantic scores were significant also.

Table 13
Correlations Between Educator Scores and
Semantic Dictionary Scores of Student Attitudes
at the Start of the Quantitative Analysis Course (n=25)

	Educator Scores			
Semantic Dictionary Scores	Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.446 *	.356	.545 *	.553 *
Potency	.365	.452 *	.381	.495 *
Activity	.522 *	.260	.525 *	.558 *
Composite	.511 *	.416 *	.565 *	.621 *

* significant at the p=.05 level

Table 14 shows that the majority of the correlations involving Educator 3 and the semantic scores were significant. No other correlations were significant.

Table 14
Correlations Between Educator and
Semantic Dictionary Scores of Student Attitudes
at the End of the Quantitative Analysis Course (n=26)

	Educator Made Scores			
Semantic Dictionary Scores	Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.198	.283	.447 *	.337
Potency	.253	.338	.419 *	.374
Activity	.022	.142	.176	.135
Composite	.185	.285	.416 *	.330

* significant at the p=.05 level

Because half of the correlations, 16 out of 32, are significant, the null hypothesis is rejected for the quantitative analysis course.

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Correlations then were calculated between the various educators' scores. Table 15 shows that the correlations with Educator 2's scores were very low. This shows a conciderable variance between the scores of Educator 2 and the other educators. The correlations with the average of all the educators' scores were all significant. This parallels the correlations between the semantic scores and the educator scores. There only the correlations of the average of the educators' scores provided significant correlations with all of the semantic scores. These results suggest that where significant correlations were not obtained between semantic scores and educator scores, the lack of significance was due to variance in the educator scores.

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Table 15

Correlations Between Educators at the Start of the Quantitative Analysis Course (n=25)

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000 *	.254	.881 *	.880 *
Educator 2	.254	1.000 *	.276	.632 *
Educator 3	.881 *	.276	1.000 *	.894 *
Average of Educators	.880 *	.632 *	.894 *	1.000 *

* significant at the p=.05 level

Table 16 shows that there were significant but low correlations between the educator scores at the end of the course. The low intereducator correlations, indicating

considerable intereducator variance in scoring, may account for the lack of significant correlations between semantic scores and educator scores at the end of the course.

Table 16

Correlations Between Educators at the End of the Quantitative Analysis Course (n=26) *

	Educator 1	Educator 2	Educator 3	Average of Educators
Educator 1	1.000	.598	.815	.924
Educator 2	.598	1.000	.640	.810
Educator 3	.815	.640	1.000	.916
Average of Educators	.924	.810	.916	1.000

* all correlations are significant at the p=.05 level

4.3.2 Attitudes and Concurrent Achievement in Quantitative Analysis

The null hypothesis that "there is no correlation between achievement and concurrently measured attitude scores" was investigated in the quantitative analysis course. Correlations were calculated between the semantic dictionary produced scores of the research instruments and the concurrent achievement grades. The semantic scores from the start of the course were compared with the achievement scores of the prerequisite course. The semantic scores from the end of the course were compared with the final achievement scores in the course. Similar correlations were calcualted between educator made attitude scores and

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achievement scores for comparison purposes.

Table 17 shows that no significant correlations were found between the attitude scores and the final course scores. This may be due to the uncertainty of many of the students whether or not the course will be useful in their future. The correlations for the evaluation, activity, and composite semantic and the average of educators' scores with the prerequisite scores were significant but negative.

Table 17

Concurrent Correlations Between Attitude Scores and Student Achievement in Quantitative Analysis

	Start of Course n=25	End of Course n=26	Both Times n=51 (**)
Semantic Dictionary Scores			
Evaluation	-.594 *	-.097	-.372 *
Potency	-.293	-.274	-.284 *
Activity	-.570 *	-.124	-.369 *
Composite	-.581 *	-.180	-.398 *
Educators' Scores			
Educator 1	-.267	-.007	-.133
Educator 2	-.323	-.121	-.225
Educator 3	-.305	-.134	-.221
Average of Educators	-.377 *	-.071	-.230

* significant at the p=.05 level
** calculated using Fisher's Zr

Due to the low number of significant correlations, the null hypothesis is not rejected for quantitative analysis. The negative nature of the correlations supports the expectation of a negative achievement motivation due to the

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students' requirement of this course and thus their work to avoid failure in it.

4.3.3 Attitudes and Later Achievement in Quantitative Analysis

The null hypothesis that "there is no correlation between final achievement and attitude scores calculated at the start of the course of study" was investigated in the quantitative analysis course. Correlations were calculated between the semantic dictionary produced scores of the research instrument from the start of the course and the final achievement scores. Similar correlations were calculated between educator made attitude scores and final achievement scores for comparison purposes. The correlations are contained in Table 18.

Table 18

Predictive Correlations Between Attitude Scores and Student Achievement in Quantitative Analysis (n=23)

Semantic Dictionary Scores	
Evaluative	-.567 *
Potency	-.203
Activity	-.412 *
Composite	-.492 *
Educators' Scores	
Educator 1	-.358 *
Educator 2	-.347
Educator 3	-.324
Average of Educators	-.404 *

* significant at the p=.05 level

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Table 18 shows that the majority of the correlations are significant. The null hypothesis is therefore rejected for the cases of the evaluation, activity and composite semantic scores and the scores of Educator 1 and the average of the educators. The negative nature of the correlations supports the expectation of a negative achievement motivation due to the students' requirement of this course and thus their work to avoid failure in it.

4.4 Findings for All Courses Studied

The courses studied; computing, electronics, and quantitative analysis, represent a wide diversity within vocational and technical education. The computing course was an option in a vocational business program. The electronics course was in the major area of study in an engineering technology program. The quantitative analysis course was a compulsory course outside the major area of study in a vocational business program.

The research instrument was administered at the end of the first week of classes and again during the last week of classes.

Of the 56 students who both had a prerequisite grade and completed the first research instrument, 64 per cent were male, 36 per cent were female and the average age was 22 years. Of the 53 students who both had a final grade and

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completed the second research instrument, 66 per cent were male, 34 per cent were female and the average age was 21 years. Of the 51 students who had a final grade and completed the first research instrument, 73 per cent were male, 27 per cent were female and the average age was 22 years. The oldest student was 39 years old and the youngest was 18 years old.

There was a large variety of attitude expressed in the courses. In some cases students felt that the subject matter was useful and in other cases they felt that it was useless. In some cases they felt that the course had met their goals and expectations and in other cases they felt that the course had not. In some cases attitudes towards the subject increased and in others they decreased.

Two types of comparisons were made to determine the generality of the findings. The first method was to total the number of significant correlations, for each hypothesis researched. This number was then compared with the total number of correlations. This method indicates predominant trends in the findings. The second method was to compute average correlations with the use of Fisher's Zr for each hypothesis researched. Levels of significance were then obtained from tables for the total number of subjects in the combined sample.

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4.4.1 Semantic Dictionary Attitude Measures Across Courses

The null hypothesis that "the scoring of the research instrument does not correlate with the affective attitude of the students towards the subject of study" was investigated in the study. Correlations were calculated between educator scores of the students' attitudes and the semantic dictionary scores of the same research instruments. No significant correlations were obtained from the computing course. The number of significant correlations occouring between educator and semantic dictionary attitude scores are shown in Table 19.

Table 19

Occurrences of Significant Correlations Between Educator Scores and Semantic Dictionary Scores of Student Attitudes In The Study (n=6) *

	Educator Scores			
Semantic Dictionary Scores	Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	3	1	4	3
Potency	1	2	2	2
Activity	2	1	3	3
Composite	3	2	4	3

* significant at the p=.05 level

Table 19 shows that the largest number of significant correlations occurred with the composite and the evaluation semantic scores. It also shows that only one educator, Educator 3, had a greater number of significant

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correlations than did the average of the educators' scores. This is the person with industrial rather than school room experience. Educator 3 is also the researcher and thus would be in a position to possibly be contaminated by his involvement. The table also shows that the majority of the correlations, 39 out of 64, were significant.

The overall correlations between educator and semanitc are in Table 20. It shows that the highest correlations usually occurred with the composite semantic scores. The correlations with evaluation semantic scores were consistently lower than but close to those of the composite semantic score. It also shows that the average of all educators' scores usually had a higher correlation than did the scores of individual educators. This demonstrates the lack of reliability in the scoring of the individual educators.

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Table 20

Correlations Between Educator Scores and Semantic Dictionary Scores of Student Attitudes In The Study (n=109) * **

Semantic Dictionary Scores	Educator Scores: Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.419	.331	.376	.428
Potency	.311	.288	.295	.363
Activity	.340	.230	.408	.358
Composite	.422	.337	.387	.440

* all correlations are significant at the p=.05 level
** correlations calculated using Fisher's Zr

Both Table 19 and Table 20 show that there are significant correlations between educator scores and semanitc dictionary scores of student attitudes. The null hypothesis is therefore rejected for the study.

4.4.2 Attitudes and Concurrent Achievement In The Study

The null hypothesis that "there is no correlation between achievement and concurrently measured attitude scores" was investigated in the study. Correlations were calculated between the semantic dictionary produced scores of the research instruments and the concurrent achievement grades. In one of the three courses, quantitative analysis, there were only strong, negative correlations which were significant. The negative nature of these correlations was shown to be consistent with the theory of negative achievement motivation, as would be expected in a compulsory course such as the quantitative analysis course. In the other two courses, only strong, positive correlations were significant. Since strong, significant correlations can be used descriptively in both cases, the absolute values of the correlations were used in computing composite correlations.

Table 21 shows that the evaluation scores produced the largest number of significant correlations. It also shows that the evaluation scores produced the largest correlation. The composite semantic scores produced the next largest correlation. Since the attitude scoring techniques

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produce significant average correlations, the null hypothesis can be rejected for the study.

Table 21

Concurrent Correlations Between Attitude Scores and Student Achievement In The Study (n=108) *

	Number of Significant Correlations	Average Correlation **
Semantic Dictionary Scores		
Evaluation	5 / 6	.453
Potency	1 / 6	.328
Activity	2 / 6	.339
Composite	3 / 6	.448
Educators' Scores		
Educator 1	2 / 6	.352
Educator 2	1 / 6	.287
Educator 3	2 / 6	.371
Average of Educators	4 / 6	.377

* all average correlations are significant at the p=.05 level
** average correlations calculated usnig Fisher's Zr

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4.4.3 Attitudes and Later Achievement In The Study

The null hypothesis that "there is no correlation between final achievement and attitude scores calculated at the start of the course of study" was investigated in the study. Correlations were calculated between the semantic dictionary produced scores of the research instrument from the start of the courses and the achievement scores. In one of the three courses, quantitative analysis, there were only strong, negative correlations which were significant. The negative nature of these correlations was shown to be

consistent with the theory of negative achievement motivation, as would be expected in a compulsory course such as quantitative analysis. In the other courses, only strong, positive correlations were significant. Since significant correlations can be used predictively in both cases, the absolute values of the correlations were used in calculating composite correlations. The results are shown in Table 22.

Table 22

Predictive Correlations Between Attitude Scores and Student Achievement In The Study (n=49) *

Semantic Dictionary Scores	Number of Significant Correlations	Average Correlation **
Evaluation	2 / 3	.404
Potency	1 / 3	.374
Activity	1 / 3	.288
Composite	2 / 3	.430
Educators' Scores		
Educator 1	1 / 3	.357
Educator 2	1 / 3	.366
Educator 3	1 / 3	.398
Average of Educators	2 / 3	.407

* all average correlations are significant at the p=.05 level

** average correlations calculated using Fisher's Zr

Table 22 shows that the evaluation and composite semantic scores and the average of the educators' scores produced the largest number of significant correlations. It also shows that the largest correlation was produced by the composite semantic score. The average of the educators' scores and the evaluation semantic score produced the next

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correlations. Since the attitude scoring techniques produce significant average correlations, the null hypothesis can be rejected for the study.

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Chapter V

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This study investigated the use of a semantic dictionary in scoring students' essays to determine the evaluation, potency, and activity dimensions of attitudes contained in the essays. It found that there was a significant correlation between these semantic dictionary attitude scores and general attitude scores of three educators. It then correlated these attitude scores with both current and future achievement scores. Significant correlations were found in both of these groups of correlations indicating both concurrently and predictively valid relationships respectively. The evaluation semantic score and the composite semantic score were the best attitude measures. They provided the most correlations and the largest correlations respectively.

5.2 Conclusions

1. This study suggests that there is a significant, observable correlation between a student's attitude towards a course and his achievement in that course. It is sometimes positive and sometimes negative.
2. This study suggests that there is a significant, observable correlation between the rating by

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educators and by a semantic dictionary of a student's attitude, as expressed in an essay on the subject of a course.

3. This study suggests that there is a significant, observable correlation between a student's achievement in a course and his attitude towards that course as measured concurrently by an essay type questionnaire scored by a semantic dictionary. It further suggests that this correlation is greater than if the essay type questionnaire were scored by an educator.

4. This study suggests that there is a significant, observable correlation between a student's achievement in a course and his attitude towards that course as measured at the start of the course by an essay type questionnaire scored by a semantic dictionary. It further suggests that this correlation is greater than if the essay type questionaire were scored by an educator.

5. This study suggests that the descriptive and predictive properties of a semantic dictionary scored essay type attitude test are generalizable for use in testing students' attitudes towards the various subjects in vocational and technical education. It further suggests that each class will have its own

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scale of scores that will correlate with achievement scores. In some cases, this scale will provide negative correlations.

5.3 Recommendations

1. This study produced good results despite the fact that the semantic dictionary was only scored to two significant digits. It is recommended that an even larger semantic dictionary be built and that it be researched in such a way as to provide at least three digit accuracy.

2. This study ignored words that were not in the semantic dictionary. It is recommended that when a new semantic dictionary is produced it should contain information on how to research and add to the dictionary additional words as they become necessary. It is also recommended that a listing of "null value words" be compiled of words like "a" and "an" that add little or no meaning to an essay so that they can be systematically excluded in the process of using a semantic dictionary to score an essay.

3. This study only used three classes from one educational institution. Since it produced good results, it is suggested that the study be conducted on a much larger scale to confirm and elaborate on the results.

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4. This study found negative as well as positive correlations of attitude with achievement. It is recommended that further study be conducted to investigate the conditions that cause a course to have a negative correlation between students' attitudes and achievements.

5. This study dealt with a composite of past, present and future attitudes. It is recommended that further study be conducted to determine the relations of the students' attitudes toward a subject in each of the past, present and future tenses and how these tenses and the combinations of them relate to future achievement.

6. This study dealt with attitude towards subject. It is recommended that further study be conducted to determine the relations of the student's attitude towards subject, self and school and how these descriptors relate to future achievement.

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APPENDIX A

A.0 Correlation Tables with No Significant Correlations

Table A.1
Correlations Between Educator Scores and Semantic Dictionary Scores of Student Attitudes at the Start of the Computing Course (n=15)

Semantic Dictionary Scores	Educator Scores: Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.319	-.226	.233	-.043
Potency	.363	-.445	-.105	-.426
Activity	.326	-.105	.212	.084
Composite	.087	-.340	.155	-.141

Table A.2
Correlations Between Educator and Semantic Dictionary Scores of Student Attitudes at the End of the Computing Course (n=9)

Semantic Dictionary Scores	Educator Made Scores: Educator 1	Educator 2	Educator 3	Average of Educators
Evaluation	.136	-.168	-.147	-.033
Potency	.052	-.312	-.312	-.172
Activity	-.230	-.342	-.071	-.234
Composite	.001	-.325	-.204	-.164

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Table A.3

Predictive Correlations Between Attitude Scores and Student Achievement in Computing (n=9)

Semantic Dictionary Scores	
Evaluation	-.071
Potency	-.344
Activity	-.018
Composite	-.190
Educators' Scores	
Educator 1	.322
Educator 2	.216
Educator 3	-.018
Average of Educators	-.190

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